What is claimed is:

1. A direct optical amplifier for establishing a correlation between the average level of a main signal having a plurality of channels and the level of a pilot tone signal for controlling the average level of said main signal to a desired level, said direct optical amplifier comprising:

optical amplification means for amplifying the main signal and the pilot tone signal;

pumping light generation means for generating pumping light that optically pumps said optical amplification means;

wavelength analysis means for analyzing the spectral intensity of an optical transmission signal that includes the main signal and the pilot tone signal and extracting the level of the pilot tone signal and the average level of the main signal from which a noise component has been eliminated;

pilot tone signal monitor means for monitoring the level of the pilot tone signal that has been extracted by said wavelength analysis means;

main signal monitor means for monitoring the average level of the main signal from which a noise component has been eliminated and which has been extracted by said wavelength analysis means;

processing means for establishing a correlation

between the level of the pilot tone signal that is monitored by said pilot tone signal monitor means and the average level of the main signal from which the noise component has been eliminated and which is monitored by said main signal monitor means, determining the level of the pilot tone signal that corresponds to a desired average level of the main signal from which the noise component has been eliminated; and taking this pilot tone signal level as a target level; and

pumping light control means for controlling the intensity of the pumping light that is generated by said pumping light generation means and adjusting the amplification factor of said optical amplification means such that the level of the pilot tone signal that is monitored by said pilot tone signal monitor means becomes said target level that is determined at said processing means.

2. A direct optical amplifier for establishing a correlation between the average level of a main signal having a plurality of channels and the level of a pilot tone signal for controlling the average level of said main signal to a desired level, said direct optical amplifier comprising:

optical amplification means for amplifying the main signal and the pilot tone signal;

pumping light generation means for generating pumping light that optically pumps said optical amplification means;

wavelength analysis means for analyzing the spectral intensity of an optical transmission signal that includes the main signal and the pilot tone signal and extracting the level of the pilot tone signal, the average level of the main signal from which a noise component has been eliminated, and the level of amplified spontaneous emission light that is contained in the main signal;

pilot tone signal monitor means for monitoring the level of the pilot tone signal that has been extracted by said wavelength analysis means;

main signal monitor means for monitoring the average level of the main signal from which a noise component has been eliminated and which has been extracted by said wavelength analysis means;

ASE monitor means for monitoring the level of the amplified spontaneous emission light that is contained in the main signal and that has been extracted by said wavelength analysis means;

processing means for establishing a correlation between the level of the pilot tone signal that is monitored by said pilot tone signal monitor means and a level that is obtained by subtracting the level of the amplified spontaneous emission light that is contained in

the main signal and that is monitored by said ASE monitor means from the average level of the main signal from which a noise component has been eliminated and which is monitored by said main signal monitor means, determining the level of the pilot tone signal that corresponds to a desired average level of the main signal from which a noise component and an amplified spontaneous emission light component have been eliminated; and taking this pilot tone signal level as a target level; and

pumping light control means for controlling the intensity of the pumping light that is generated by said pumping light generation means and adjusting the amplification factor of said optical amplification means such that the level of the pilot tone signal that is monitored by said pilot tone signal monitor means becomes said target level that is determined by said processing means.

3. A direct optical amplifier for establishing a correlation between the average level of a main signal having a plurality of channels and the level of a pilot tone signal for controlling the average level of said main signal to a desired level, said direct optical amplifier comprising:

optical amplification means for amplifying the main signal and the pilot tone signal;

pumping light generation means for generating pumping light that optically pumps said optical amplification means;

wavelength analysis means for analyzing the spectral intensity of an optical transmission signal that includes the main signal and the pilot tone signal and extracting the level of the pilot tone signal and the average level of the main signal from which a noise component has been eliminated;

pilot tone signal monitor means for monitoring the level of the pilot tone signal that has been extracted by said wavelength analysis means;

main signal monitor means for monitoring the average level of the main signal from which a noise component has been eliminated and which has been extracted by said wavelength analysis means;

ASE data memory means for storing the level of amplified spontaneous emission light that is contained in the main signal and that has been measured in advance for each number of channels of the main signal and supplying as output the value of the level of the amplified spontaneous emission light that corresponds to the number of channels that is supplied as input;

processing means for establishing a correlation between the level of the pilot tone signal that is monitored by said pilot tone signal monitor means and a

level that is obtained by subtracting the level of the amplified spontaneous emission light that is contained in the main signal and that has been supplied as output by said ASE data memory means from the average level of the main signal from which a noise component has been eliminated and which is monitored by said main signal monitor means, determining the level of the pilot tone signal that corresponds to a desired average level of the main signal from which a noise component and an amplified spontaneous emission light component have been eliminated; and taking this pilot tone signal level as a target level; and

pumping light control means for controlling the intensity of the pumping light that is generated by said pumping light generation means and adjusting the amplification factor of said optical amplification means such that the level of the pilot tone signal that is monitored by said pilot tone signal monitor means becomes said target level that is determined by said processing means.

4. A direct optical amplifier for establishing a correlation between the average level of a main signal having a plurality of channels and the level of a pilot tone signal for controlling the average level of said main signal to a level in a desired range, said direct optical

amplifier comprising:

optical amplification means for amplifying the main signal and the pilot tone signal;

pumping light generation means for generating pumping light that optically pumps said optical amplification means;

wavelength analysis means for analyzing the spectral intensity of an optical transmission signal that includes the main signal and the pilot tone signal and extracting the level of the pilot tone signal and the average level of the main signal from which a noise component has been eliminated;

pilot tone signal monitor means for monitoring the level of the pilot tone signal that has been extracted by said wavelength analysis means;

main signal monitor means for monitoring the average level of the main signal from which the noise component has been eliminated and which has been extracted by said wavelength analysis means;

main signal limit memory means for storing the maximum levels and minimum levels of the average levels of the main signal that have been determined in advance for each number of channels of the main signal, and for supplying as output the values of the maximum level and minimum level that correspond to the number of channels that is supplied as input;

processing means for establishing a correlation between the level of the pilot tone signal that is monitored by said pilot tone signal monitor means and the average level of the main signal from which the noise component has been eliminated and which is monitored by said main signal monitor means; determining the level of the pilot tone signal that corresponds to the average level of the main signal from which the noise component has been eliminated and which is monitored by said main signal monitor means and making this level of the pilot tone signal the target level when the average level of the main signal from which the noise component has been eliminated is between said maximum level and said minimum level that have been supplied as output by said main signal limit memory means; determining the level of the pilot tone signal that corresponds to said maximum level and making this level of the pilot tone signal the target level when the average level of the main signal from which the noise component has been eliminated exceeds said maximum level that has been supplied as output by said main signal limit memory means; and determining the level of the pilot tone signal that corresponds to said minimum level and making this level of the pilot tone signal the target level when the average level of the main signal from which the noise component has been eliminated is below said minimum level that has been supplied as output

by said main signal limit memory means; and

pumping light control means for controlling the intensity of the pumping light that is generated by said pumping light generation means and adjusting the amplification factor of said optical amplification means such that the level of the pilot tone signal that is monitored by said pilot tone signal monitor means becomes said target level that is determined by said processing means.